FOREST PEST CONDITIONS IN CALIFORNIA-1988

A PUBLICATION OF
THE CALIFORNIA FOREST PEST COUNCIL

THE CALIFORNIA FOREST PEST COUNCIL (formerly the California Forest Pest Control Action Council) was founded in 1951. Its membership is open to public and private forest managers, foresters, silviculturists, entomologists, pathologists, zoologists, and others interested in the protection of forests from damage caused by animals, insects, diseases, and weeds. Its objective is to establish, maintain and improve communication among individuals -- managers, administrators and researchers -- who are concerned with these issues. This objective is accomplished by four actions:

1. Coordination of detection, reporting, and compilation of pest damage information.

2. Evaluation of pest conditions.

3. Pest control recommendations made to forest managing agencies and landowners.

4. Review of policy, legal, and research aspects of forest pest control, and submission of recommendations thereon to appropriate authorities.

The California Board of Forestry recognizes the Council as an advisory body in forest pest protection. The Council is a participating member in the Western Forest Pest Committee of the Western Forestry and Conservation Association.

This report, **FOREST PEST CONDITIONS IN CALIFORNIA - 1988**, is compiled for public and private forest land managers to keep them informed of pest conditions on forested land in California, and as an historical record of pest trends and occurrences. The report is based largely on information provided by the state-wide Cooperative Forest Pest Detection Survey, and from information generated by Forest Pest Management, Pacific Southwest Region, USDA Forest Service, while making formal detection surveys and biological evaluations.

The report was prepared by the Forest Service in cooperation with other member organizations of the Council. It was duplicated and distributed by the California Department of Forestry and Fire Protection.

COVER: The Douglas-fir tussock moth, Orgyia pseudotsugata, is now causing defoliation of white fir on some 103,000 acres of forest in northeastern California. This is more than a ten-fold increase over the acreage of 1987.

Sacramento **January 13, 1989**

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HIGHLIGHTS OF PEST CONDITIONS - 1988

STATUS OF INSECTS. Damage from bark beetles was widespread in California, but was more associated with drought stress and site competition than damage resulting from the fires of 1987. The Douglas-fir tussock moth has now reached outbreak status over 103,000 acres in Lassen, Plumas and Tehama Counties. On the other hand, the area and intensity of defoliation caused by the Modoc budworm continues to decline in Modoc County. The status of the Nantucket pine tip moth and the eucalyptus borer remain unchanged. No potential problems with the gypsy moth developed.

STATUS OF DISEASES. Excessive heat and drought damaged or killed trees on thousands of acres throughout the state. These weakened trees were more susceptible to an array of insects and diseases. Drought conditions have stressed and predisposed Douglas-firs to stem and branch cankers induced by Phomopsis sp. and other canker causing fungi. Needle scorch of redwoods was also a problem in many counties.

Increased root disease-related tree mortality was evident in 1988 as infected trees succumbed to the interaction of root diseases, drought and insects. Black stain root disease, caused by Leptographium (Ceratocystis) wageneri, on Douglas-fir is increasing along the North Coast.

Pitch canker, caused by Fusarium subglutinans, has been detected in areas located between Santa Cruz and the Bay Area, with a few isolated infections identified in Southern California.

The number of trees infected with Dutch Elm Disease has increased but the disease has not spread into new areas.

STATUS OF WEEDS. The effects of competing vegetation were enhanced by the second year of drought. The majority of control projects on private lands continue to be accomplished with herbicides. Manual treatments aimed primarily at conifer survival continue on Federal lands.

STATUS OF ANIMAL PESTS. A survey of agency and private land managers indicated that more than 200,000 acres of forest lands incurred some form of damage from animals. Deer, pocket gophers, black bears and porcupines caused the most widespread damage. Only birds and mice failed to stimulate reports of damage.

STATUS AND CONTROL OF INSECTS

WESTERN PINE BEETLE, Dendroctonus brevicomis. The western pine beetle was a primary agent of ponderosa pine mortality in the foothill areas of the western slope of the Cascade and northern Sierra Nevada Mountains. Trees typically were killed in groups, ranging from a few trees to 100+. Annosus root disease and black stain root disease were noted as important contributors to mortality. More specifically, Butte, Placer and Plumas Counties were counted as locations of significant mortality caused by the western pine beetle. In Butte County activity was widespread at 1500 to 2500 ft. Heavy infestations near and in recreational areas and campgrounds occurred in Plumas and Placer Counties. Large second growth trees were frequently involved.

There was abundant mortality in the southern Sierra Nevada. Specific detection reports were received from Amador, El Dorado and Kern Counties, but increasing mortality throughout the lower elevation pine type indicates that substantial tree mortality occurred in all the counties by September.

Curiously, tree mortality in Yosemite National Park took a different trend. An aerial flight revealed few group kills and most of this activity was located near the south entrance. Overall, mortality was less than 25% of that expected at the beginning of the spring. It may be that late spring rains relieved some of the stress of the current drought.

About 100 ponderosa pine were killed near Mt. Sanhedrin (Mendocino and Lake Counties), on Boggs Mountain Demonstration State Forest (Lake County), and Cobb Mountain (Lake County). Thirty veteran ponderosa pine within four miles of the Pacific Ocean were killed in Pacific Valley (Monterey County).

Small to large ponderosa and Coulter pines were attacked in the vicinity of Figueroa Mountain, Los Padres National Forest (Santa Barbara County). Group kills ranged from a few trees to one group of about 100 pines. None of the groups involved more than an acre. The red turpentine beetle was the primary associate.

PINE ENGRAVER BEETLES, Ips spp. Pine engravers were associated with the western pine beetle in Amador, El Dorado, Fresno, Kern, Modoc, Placer, Shasta and Trinity Counties. Other than a small amount of knobcone pine, ponerosa pine was the only host reported in these counties. Top-killing occurred in young trees and larger second growth. Drought, heavy stocking, and low site quality were reported as associated factors.

Pole-size Jeffrey pines were killed by pine engravers three miles west of Conklin Park, Milford-Beckwourth Road, Plumas County. Five to 15 groups of 20 to 60 trees were involved.

Several scattered Monterey and ponderosa pines were attacked in Santa Clara, Alameda, Mendocino and Lake Counties. Over 500 Monterey pine were attacked in

Santa Cruz County. Few attacks were noted on ponderosa and sugar pine in the 1987 fire areas in these counties.

Monterey x knobcone and Coulter pines were killed in plantations on the San Jacinto Ranger District, San Bernardino National Forest, Riverside County. Pine engravers and California flatheaded borers attacked and killed Jeffrey pines near Hemet Lake and southward through the Garner Valley, Riverside County.

FIR ENGRAVER, Scolytus ventralis. Scattered white fir mortality occurred throughout northern California. Mortality of single trees or small groups was typical. Dwarf mistletoe and annosus root disease often were associated factors. Individual reports by county indicated widespread activity in Nevada, Placer and Shasta Counties. Heavy losses were reported in the Lake Tahoe Basin.

Substantial mortality was noted in the mixed-conifer and true fir types in the southern Sierra Nevada. Mortality began to appear in the spring and preceeded the appearance of substantial mortality from pine bark beetles in the lower elevation pine type. Comparisons with levels of fir engraver activity in 1987 varied by reporter. Some thought activity was up while others thought levels of attack to be about the same in 1988 and 1987.

Individual reports by county indicated that activity was widespread in Fresno, Sierra, and Kern Counties. White fir was the primary host, but some red fir also was involved. Mortality in Yosemite National Park was concentrated in the Crane Flat area, but less than 100 trees were involved. Elsewhere in the park, mortality was scattered and less than expected.

Twenty-five to 50 white firs were killed or top-killed in the Mt. Sanhedrin area of Mendocino and Lake Counties and northwest of Bridgeville in Humboldt County.

RED TURPENTINE BEETLE, Dendroctonus ventralis. Ponderosa pines and sugar pines were attacked in Fresno and Amador Counties, but only ponderosa pine was reported as a host in El Dorado County. Stressful sites accounted for widespread attacks in association with pine engravers and the western pine beetle. Activity in Yosemite National Park was in association with the limited mortality caused primarily by the western pine beetle.

Hundreds of Monterey pines were attacked in Santa Cruz, Santa Clara, Alameda, and Napa Counties. Many attacks in Santa Cruz County were associated with trees infected with pitch canker. Many scorched ponderosa and sugar pines were attacked in the 1987 fire areas of Mendocino, Lake, and Colusa Counties. Mortality has been very light in each situation.

This beetle was a primary associate of the western pine beetle in group kills of ponderosa pine and Counter pine in the vicinity of Figueroa Mountain, Los Padres National Forest (Santa Barbara County).

FIR FLATHEADED BORER, Melanophila drummondi. Mortality of individual mature and overmature trees was scattered throughout northern California. Branch flagging and bole attacks were common on marginal sites in the Klamath River drainage

(Siskiyou County). Activity in Douglas-fir stands was scattered throughout Humboldt County, but few trees were lost.

CALIFORNIA FLATHEADED BORER, Melanophila californica. Hundreds of fire scorched ponderosa pine were attacked in 1987 fire areas of Mendocino, Lake and Colusa Counties. Pine mortality was widespread on the San Jacinto Ranger District, San Bernardino National Forest, Riverside County. Attacks occurred in conjunction with pine engraver beetles.

DOUGLAS-FIR BEETLE, Dendroctonus pseudotsugae. About 100 trees were killed in Mendocino, Lake, and Humboldt Counties. Group kills were noted west of Willits and east of Potter Valley (Mendocino County), and northwest of Bridgeville (Humboldt County). Other attacks were scattered and the beetle was only occasionally found in more interior areas.

DOUGLAS-FIR ENGRAVER, Scolytus unispinosus. A complex of pests were involved in reports of branch "flagging", top-kill, and mortality of sapling and small Douglas-fir in Lake, Mendocino, Humboldt, southwestern Trinity and Del Norte Counties. In addition to the Douglas-fir engraver, Phomopsis and Dermea cankers, S. oregoni, and Cylindrocopturus furnissi were involved. Trees were often found on south and west aspects or quickly drained soils, and in areas of high vegetative competition.

Attacks were widespread over 80,000 acres of Amador County, but Douglas-fir forms a minor component in this forested area.

MOUNTAIN PINE BEETLE, Dendroctonus ponderosae. Approximately two sugar pines per acre were attacked on the Mountain Home Demonstration State Forest, Tulare County. Sugar pines were also attacked at Latour Demonstration State Forest, Shasta County. Dozens of trees were attacked in the Mt. Sanhedrin area of Mendocino and Lake Counties. At this location a few attacks were in ponderosa pine greater than 16 in dbh, but most attacks were in sugar pine less than 12 in dbh.

JEFFREY PINE BEETLE, Dendroctonus jeffreyi. Tree mortality was noted on the Hume Lake Ranger District, Sequoia National Forest, Fresno and Tulare Counties. Elytroderma needle disease, air pollution damage, a harsh site and moisture stress contributed to tree susceptibility.

A group kill of approximately 10 jeffrey pines was reported from D.L. Bliss State Park, Lake Tahoe Basin, El Dorado County. Trees ranged from 10-20" dbh. Pines of a similar diameter were killed at Ladder Butte on the Hat Creek Rim, Lassen County.

DOUGLAS-FIR TWIG WEEVIL, Cylindrocopturus furnissi. This beetle was associated with the Douglas-fir engraver in Mendocino, Humboldt, Trinity and Del Norte Counties. Branches and tops of small diameter (<1 inch diam.) were infested in thousands of trees. This was the second year of high occurrence, with 1988

populations greater than those of 1987. In Amador County, this weevil damaged landscape trees.

PINE REPRODUCTION WEEVIL, Cylindrocopturus eatoni. The pine reproduction weevil caused significant mortality to young (2-5 yrs) ponderosa pine in plantations located around Peavine Ridge on the Pacific District, Eldorado National Forest (El Dorado County). Most of the mortality occurred in plantations stressed by brush competition, low site quality, or both.

A six-year-old plantation of ponderosa pine located on the Quincy Ranger District, Plumas National Forest (Plumas County), had 20% of the trees damaged. Site quality was III-. Seedling mortality also occurred on a harsh site with brush competition near Manton, Tehama County.

TWIG BEETLES, Pityophthorus spp. Hundreds of pines were attacked in Santa Clara, Santa Cruz, and Mendocino Counties. Most of these were previously under stress. Similarly, young Douglas-firs in Trinity and Humboldt Counties were attacked by P. pseudotsugae. This beetle also mass attacked white fir 3-7" dbh in Donner State Park, El Dorado County. These attacks began in the fall of 1987 and continued in 1988.

CEDAR BARK BEETLES, Phleosinus sp. Incense-cedar mortality was mostly scattered, but exceptions occurred under conditions of moisture stress. Along Burney Creek, Shasta County, a combination of drought and rapidly drained soils resulted in attacks on numerous trees by cedar bark beetles and wood borers. Cedars on shallow soils overlaying base rock died with and without attacks on the Tahoe National Forest, Placer County.

A cedar bark beetle was associated with localized mortality of Port-Orford-cedar in Del Norte County. Port-Orford-cedar root disease occurred on some trees, but was absent in others.

Phloeosinus sequoiae attacked about 10 to 15 redwoods near Navarro and Point Arena, Mendocino County.

GYPSY MOTH, Lymantria dispar. The number of moths trapped remained within the range of the past four years. The number of counties involved also has remained relatively stable (Table I).

TABLE I. CALIFORNIA GYPSY MOTH SITUATION

Years	Traps Placed	Adults Trapped	Counties	Properties with Eggs/Pupal Cases	Sites Treated
1984	30,000	25	9	2	5
1985	28,000	28	10	3	2
1986	27,000	20	9	1	0
1987	19,000	6	5	1	1
1988	20,000	13	6	0	0

The establishment of the gypsy moth in Oregon would be of great concern in California because that would greatly increase the rate of introduction into the state. However, the gypsy moth situation continues to improve in Oregon. It appears that 30,000 traps will catch less than 20 moths in 1988. These catches have been scattered from the Portland area to Cave Junction (Table II). The latter is only 20 miles north of Del Norte County, California. For the second consecutive year, no moths were caught near Glide (Douglas County), and it appears that the infestation may have been eliminated. The program to eradicate infestations treated approximately 10,000 acres with Bacillus thuringiensis.

Table II. 1988 GYPSY MOTH DETECTIONS IN OREGON[a]

County	City/Area	Total Male Moths Caught	Trap Density
Benton	Corvallis	1	1/mi^2 (increased)
Clackamas	Lake Oswego	4	3-9/acre
Jackson	Ashland	1	4/mi^2 (increased to 16-49/sq. mi.)
Josephine	Cave Junction Area	3	25/mi^2 (increased)
Lane	Blanton Road	1	16/mi^2
	TOTAL	10	

a. As of 10/25/88, Oregon Department of Agriculture, Salem, Oregon. Our thanks to LeRoy N. Kline, Oregon Dept. of Forestry, for providing this information.

DOUGLAS-FIR TUSSOCK MOTH, Orgyia pseudotsugata. The Douglas-fir tussock moth outbreak expanded in 1988 to cover a total of 103,000 acres over several locations in Lassen, Tehama and Plumas Counties -- a 10-fold increase from 1987. New areas of outbreak with apparently viable and abundant egg masses include Indicator Peak, just south of Susanville, Lassen and Plumas National Forests; Stover Mountain, Butt Mountain and Ruffa Ridge, west of Lake Almanor, Lassen National Forest; and Wheeler Peak, Mt. Ingalls, and Grizzly Ridge, west and north of Lake Davis, Plumas National Forest.

Early fall observations suggest that tussock moth populations are collapsing in some portions of the core-outbreak areas of 1987. These areas include Gibsonville, Washington Ridge to the south of Meadow Valley, and Thompson Creek, all on the Plumas National Forest, and near Little Grizzly Valley, Lassen National Forest.

In late autumn the Eldorado National Forest found approximately 600 acres of defoliation near Camp Creek on the Placerville Ranger District.

Fall and spring field work will better define the limits of all of the outbreak areas and evaluate the overwintering populations (egg masses) for virus incidence.

MODOC BUDWORM, Choristoneura retiniana. Defoliation was light to moderate on white fir located on about 20,000 acres of Modoc County. This is the smallest acreage involved since the infestation began five years ago. No tree mortality was reported.

NANTUCKET PINE TIP MOTH, Rhyacionia frustrana. The range of this introduced insect remains Alameda, Fresno and Santa Cruz Counties in the north, and Kern, Orange, San Bernardino and San Diego Counties in southern California.

BALSAM TWIG APHID, Mindarus abietinus. About 20% of the spring planting of white fir at the Placerville Nursery, El Dorado County, is now infested, while 25-30% of the 1987 planting remains infested. This aphid also damaged white fir Christmas trees in a plantation near Shingletown, Shasta County.

LODGEPOLE NEEDLEMINER, Coleotechnites milleri. Populations in the refuge areas of Yosemite National Park were up 100 to 200% over last year. However, damage was only slightly greater than 1987.

GOUTY PITCH MIDGE, Cecidomyia piniinopis. The number of detection reports and general impressions of field personnel indicate that the level of damage is down considerably from the past few years.

TENT CATERPILLAR, Malacosoma sp. According to observations by Mammoth Ranger District personnel, the tent caterpillar infestation on antelope bitterbrush in Inyo and Mono Counties declined significantly when compared to 1987 infestation levels. High populations had persisted for four years in most areas without causing significant bitterbrush mortality. This population decline is consistent with reports of decreasing tent caterpillar populations in eastern Oregon.

Analysis of larvae collected in the spring of 1988 indicated that about 29% of the 215 larvae examined were infected by a nucleopolyhedrosus virus (NPV). A bacterium, Bacillus cereus, was also found infecting the larvae. B. cereus is a potential pathogen that can cause a fatal septicemia in insects under stress, and may have contributed to the population decline along with the virus.

Severe defoliation of blue oak, Quercus douglassii, occurred in the northern Sacramento Valley from Cottonwood to Redding (Tehama and Shasta Counties). This was an intensification of damage that began in 1987. Many rural and urban oaks were completely defoliated and droppings from caterpillars were a nuisance in some areas. Injury was minimal as almost all branches and trees refoliated.

WHITE FIR NEEDLEMINER, Epinotia meritana. Moderate to heavy defoliation on white and red fir was reported over approximately 1,000 acres in the vicinity of Hoffman Mountain and Little Rancheria Creek on the Kings River District, Sierra National Forest (Fresno County). This is at least the second year of the infestation. Defoliation is somewhat patchy, and little direct or secondary mortality (due to fir engraver activity) has been observed.

EUCALYPTUS LONGHORNED BORER, Phoracantha semipunctata. There was a small outbreak in Orange County, but the eucalyptus borer did not appear to increase its range in southern California beyond spreading back to Catalina Island (Los Angeles County). Hydro-seeding of eucalyptus has decreased in southern California, but continues to occur; and this results in dense stands where competitive stress soon results. Such a condition favors buildup of the borer population. Sign companies are changing the time of year of tree pruning to avoid favoring the insect.

WESTERN PINESHOOT BORER, Eucosma sonomana. This insect was common in plantations on the Buckhorn Burn, Oak Knoll Ranger District, Klamath National Forest (Siskiyou County).

CALIFORNIA OAKMOTH, Phryganidia californica. About 100 California live oak were defoliated near the northern border of Monterey County. Defoliation also occurred on the Monterey Peninsula. Tan oaks on about 500 acres were defoliated at Jackson Demonstration State Forest (Mendocino County).

CUTWORMS, Noctuidae. An unidentified species of cutworm caused unacceptable levels of mortality to container stock planted as part of a 47-acre revegetation project for a hydroelectric site near Tule Meadow, Kings River District, Sierra National Forest (Fresno County). Damage was unevely distributed within the area, and mortality was estimated to be about 10 to 20% of the total planting. True fir suffered the most damage; Jeffrey pine and snowbrush, Ceanothus cordulatus, were attacked also.

CONE AND SEED INSECTS. Larvae of Dioryctria sp. caused considerable damage to sugar pine cones of rust-resistant sources at the Badger Hill Breeding Arboretum, Eldorado National Forest. This is the first year that serious damage has occurred. Extensive seed loss in red fir was reported from a private property in Sierra County.

Ponderosa cones delivered to the Placerville Nursery appeared to contain greater numbers of seedworms, Cydia spp., than recent years. However, numbers were not great enough to discourage collection. The white fir cone crop was poor in 1988 and red and white fir cones delivered to the nursery contained a wide variety of insects that severly damaged many of the cones -- coneworms, Dioryctria spp., seed chalcids, Megastigmus spp., the fir seed maggot, Earomyia abietum, and the cone moth, Barbara sp. Cones of coastal Douglas-fir continued to be heavily damaged by the Douglas-fir cone gall midge, Contarinia oregonensis.

Figure 1. The silk of windblown, first-stage larvae of the Douglas-fir tussock moth forms halos atop overstory white firs, Plumas County.

Figure 2. The high populations levels found in Figure 1 often lead to severe defoliation of stands of white fir.

TABLE II. INSECTS OF LESSER IMPORTANCE IN CALIFORNIA - 1988

INSECTS			WHERE EXAMINED OR REPORTED	
Scientific Name	Common Name	Host	County	Remarks
Acrididae	Shorthorn grasshopper	PP	Modoc	3-year-old plantation
Adelges cooleyi	Cooley gall aphid	DF	Humboldt; Mendocino	Scattered damage on pole-size trees; north of Ft. Bragg
Adelges tsugae	Hemlock woolly adelgid	WH	Del Norte	Landscape trees
Altica ambiens	Alder flea beetle	AL	Trinity & Mendocino	Heavy defoliation in some riparian areas
Cicada sp.	Cicada	DF	Mendocino, Humboldt & Plumas	Incidence of ovi-position wounds has increased over past two years
Cinara sp.	Conifer aphid	SP	El Dorado	Badger Hill Seed Orchard.
		WF	Shasta	Christmas trees
Coptodisca arbutiella	Madrone shield bearer	MA	Siskiyou & El Dorado	Noted in urban and rural areas
Dioryctria sp.	Coneworm	WF	El Dorado	Nursery seedlings
Elatobium abietinum	Spruce aphid	SS	Humboldt	100+ trees at Stone Lagoon & Rock Creek
Eurytoma tumoris	Eurytoma gall midge	PP, SP	Yuba and Plumas; El Dorado	Swellings on branches; a superior guar pine
Hyphantria cunea	Fall webworm	MA	Siskiyou & Trinity	Scattered pockets along Klamath River and Rush Creek, re-spectively.
Matsucoccus bisetosus	Ponderosa pine twig scale	PP	Shasta & Plumas	Damage barely notice-able, much reduced from 1986-1987
Neodiprion sp.	A sawfly	MU	San Mateo	Urban trees

TABLE II. (Cont.)

INSECTS			WHERE EXAMINED OR REPORTED	
Scientific Name	Common Name	Host	County	Remarks
Neodiprion sp.	Pine sawfly	PP	Siskiyou; Mendocino	Roadside trees; a few trees near Covelo
Nuculaspis californica	Black pineleaf scale	SP	Shasta	Sawtimber
Parthenolecanium corni	European fruit lecanium	MA	Amador	Found on 5,000 acres
Platynota stultana	Omnivorus leafroller	WF,SP	Butte	Always present at Chico Tree Improvement Center
Otiorhynchus spp.	Root weevils	DF	Humboldt	Nursery seedlings
Scolytus praeceps	A white fir engraver	WF	El Dorado	Donner State Park, mass attacks along with P. pseudotsugae.
Steremnius sp.	A root-collar weevil	PP	Siskiyou & Madera, Plumas	Seedlings, seed orchard near Meadow Valley
Thripidae	A thrips	RB	El Dorado	Nursery plants in rust-resistance program.
Vespamina sequoiae	Sequoia pitch moth.	MP	Mendocino, Santa Cruz; Josephine (Oregon)	100's of urban and rural trees; Calif. superior trees at Merlin seed orchard
Zellaria haimbachi	Pine needle-sheath miner	JP	Nevada	Scattered over 600 acres

HOST ABBREVIATIONS

AL = Alder
DF = Douglas-fir
JP = Jeffrey pine
MA = Madrone
MP = Monterey pine
MU = Mugo pine
PP = Ponderosa pine
RB = Ribes sp.
SP = Sugar pine
SS = Sitka spruce
WF = White fir
WH = Western hemlock

STATUS AND CONTROL OF DISEASES

ABIOTIC DISEASES. Excessive heat and drought caused injury to true fir and Jeffrey pine scattered throughout hundreds of acres on the Truckee Ranger District, Tahoe National Forest (Nevada and Sierra Counties); to ponderosa and Jeffrey pine (150-200 trees) on the Eagle Lake Ranger District, Lassen National Forest (Lassen County); to ponderosa pine on the McCloud Ranger District, Shasta-Trinity National Forest (Siskiyou County); and to red fir (10-20 acres) on the Placerville Ranger District, Eldorado National Forest (El Dorado County). Damage to white fir, Douglas-fir and hardwoods was reported in Humboldt County along Cow Creek, Garrett Creek and Bradford Creek on more than 400 acres. High temperatures immediately following root under-cutting caused widespread mortality in red fir at the Placerville Nursery (El Dorado County).

Wet snow caused broken tops, and downed trees in conifers and hardwoods in the Weitchpec-Orleans area (Humboldt County).

More than one hundred redwoods with western and southern crown exposures sustained needle desiccation due to consecutive days of extreme high temperatures in most coastal counties.

Roadside salt damage was widespread in the Lake Tahoe Basin (Placer and El Dorado Counties). All conifer species and some evergreen shrub species exhibited varying degrees of damage.

FOLIAGE DISEASES. Signs and symptoms of Elytroderma needle disease (Elytroderma deformans)[1] were more common in 1988 than in previous years in many areas, including the San Gorgonio District, San Bernardino National Forest (San Bernardino County), Greenhorn District, Sequoia National Forest (Kern County), Hat Creek District, Lassen National Forest (Shasta County) and the Lake Tahoe Basin (Placer and El Dorado Counties).

Red band needle blight (Scirrhia (Dothistroma) pini) was reported on Monterey pine in Humboldt and Mendocino Counties. More than one hundred Monterey pines are lightly to severely affected near Parlin Fork on the Jackson Demonstration State Forest (Mendocino County).

Douglas-fir needle cast (Rhabdocline pseudotsugae) was noted over approximately 5 acres on the Jackson Demonstration State Forest (Mendocino County).

Maple scorch of big leaf maple was locally severe throughout its range. The causal agent of this damage is still undetermined. Xylem-limited bacteria were suspected, but were not recovered from samples submitted to the California Department of Food and Agriculture Laboratory.

1. Scientific names of causal pathogens are given in parentheses following the common names.

NURSERY DISEASES. Disease problems at Humboldt Nursery (Humboldt County) included: mortality and damage due to heat stress followed by Fusarium sp. on 1-0 ponderosa pine and 1-0 Douglas-fir; needle tip dieback and mortality attributed to undetermined chemical or environmental factors in ponderosa pine 1-0 plug stock and 2-0 red and white fir; scattered damage from Phomopsis canker (Phomopsis occulta) on 2-0 Douglas-fir seedlings; and weakening of 1-0 Douglas-fir plug stock by Botrytis sp. (gray mold) and other storage molds. Gray mold also damaged redwood in the nursery beds. Chemical injury occurred in Douglas-fir, red fir and white fir in an experimental trial of dazomet fumigant. Changes in time of application will be tried in an attempt to overcome this problem. A dazomet trial is also underway at the Placerville Nursery.

ROOT DISEASES. Tree mortality involving root disease increased in 1988 as infected trees succumbed to the interaction of root diseases, drought and insects. Numerous reports of black stain root disease (Leptographium (Ceratocystis) wageneri) on Douglas-fir were received from the north coast. Plantations of Douglas-fir in Mendocino, Humboldt, Trinity and Del Norte Counties are being significantly affected and concerns about the potential effects of the disease are recurring.

Ponderosa pine stands on the McCloud Ranger District, Shasta-Trinity National Forests (Siskiyou County), were surveyed for annosus root disease (Heterobasidion annosum). Incidence of the fungus in stumps in four older sale areas in eastside pine revealed that an average of 18% were infected. The range was 14 to 24%. Two mixed conifer stands were surveyed similarly, but only 0 and 4% of the stumps were infected in this forest type. The use of borax has been initiated on the District. Twenty scattered sugar pine were killed by H. annosum on Boggs Mountain Demonstration State Forest (Lake County).

Port-Orford-cedar root disease (Phytophthora lateralis) remains widespread in the Smith River drainage in Del Norte County. Ornamental hedgerow trees along a parkway in a residential area of Crescent City have been dying for several years. Ten trees were infected in the town of Trinidad (Humboldt County). Affected trees are often attacked by the redwood bark beetle, Phloeosinus sequoiae.

Armillaria root disease (Armillaria sp.) killed a few scattered Douglas-fir at Boggs Mountain Demonstration State Forest (Lake County). The disease also killed about 30 Douglas-fir seedlings and saplings northwest of Ukiah (Mendocino County). One hazard oak tree was removed in the town of Willits (Mendocino County) and two infected Pacific yews in the Smith River drainage (Del Norte County) were destroyed.

CANKER DISEASES. Surveys for incidence of pitch canker (Fusarium subglutinans) continued in 1988. In addition to those areas noted in last year's report, pitch canker is now known to occur from the northern city limits of Santa Cruz, south to Moss Landing, southeast to Salinas, and northeast to the western portion of San Benito County, including Aromas (Fig. 3). Infestations have also been confirmed in southern San Francisco (San Francisco County), Nipomo, San Luis Obispo County), Santa Barbara (Santa Barbara County), Torrance (Los Angeles County) and Escondido (San Diego County). The Nipomo infestation (one tree) has

been eliminated. Over one thousand Monterey pine are affected in the Santa Cruz area, and a lesser amount in the Hayward-San Leandro area. The California Department of Transportation (CALTRANS) has removed or pruned many of the severely affected trees and removed those eventually killed by insects. Continued investigations to determine the spread and potential threat of this disease in California are underway.

Madrone canker (Fusicoccum sp.) continues to cause branch or tree mortality throughout much of the coastal region. Over 100 infected trees were reported in Santa Cruz County, over 1000 were reported from throughout Mendocino County, and five were reported in Boggs Mountain Demonstration State Forest (Lake County).

Approximately a dozen redwood trees at Jackson Demonstration State Forest (Mendocino County) and the town of Ukiah (Mendocino County) had branch flagging due to cankers similar to Cypress canker (Seridium cardinale). No isolations were made. Several cypress in a park in the city of Monterey (Monterey County) also were attacked by S. cardinale.

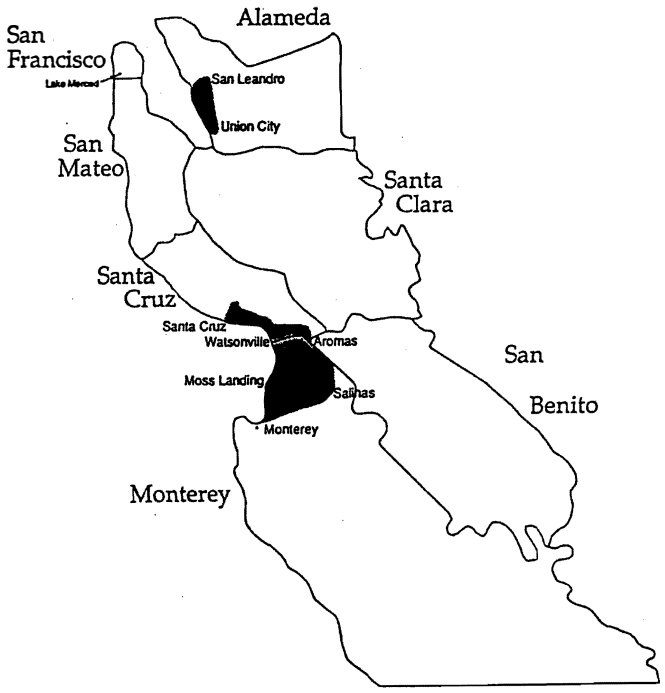


Figure 3. Present location of pitch canker disease in the greater Bay Area.

DWARF MISTLETOES, Arceuthobium spp. The status of dwarf mistletoes has not substantially changed from previous years -- they remain widespread and continue to cause growth loss and tree mortality. Four suppression projects were implemented on Forest Service and Park Service managed lands in 1988. The High Country Recreation Area project on the Angeles National Forest (Los Angeles County), initiated in 1987, is now 80% complete. A three-year project at

Prairie Fork recreation area, also on the Angeles National Forest, was initiated. Suppression efforts continued in Kings Canyon National Park (Fresno County) and on the Lake Tahoe Basin Management Unit (Placer and El Dorado Counties). Several areas in the LTBMU were treated by means of pruning and tree removal; presuppression work was conducted in anticipation of 1989 projects. Plans for a five-year suppression project on the San Bernardino National Forest were initiated. Presuppression work is expected to begin in 1989.

Twenty acres of infestation were reported on sugar pine near Stonyford (Colusa County). Elsewhere, land owners are concerned with the levels of infection on Bishop pine near Mendocino (Mendocino County).

AIR POLLUTION. The 28 ozone injury trend plots on the Sequoia National Forest indicate that overall tree health is improving. These sites were last visited in 1986 and were initially established in 1977. As compared to 1986, 68% of the plots showed less injury, 25% showed more injury and 7% were unchanged. This is the greatest overall improvement in injury scores since 1977. Although the same number of trees had symptoms as compared to 1986, trees generally had more years of needle retention, which caused injury ratings to be less severe. Overall injury levels remain in the light to moderate range.

RUST DISEASES. Incidence of western gall rust (Endocronartium harknessii) prompted reports of hundreds of infected Monterey pines in the McKinleyville area of Humboldt County. Ten Austrian pine were reported as infected in Yountville (Napa County), and 5 acres of ponderosa pine were affected northwest of Willits (Mendocino County). The fungus was reported on Monterey pine poles in a windbreak in the Eel River Conservation Camp, Redway (Humboldt County).

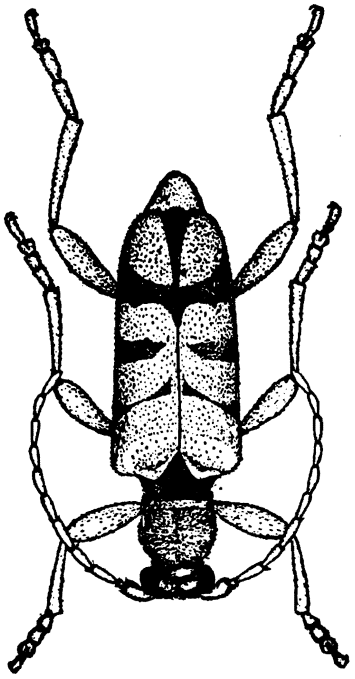
White pine blister rust (Cronartium ribicola) was reported on sugar pine at the Chico Tree Improvement Center, Mendocino National Forest (Butte County); Eagle Sale area, Doublehead Ranger District, Modoc National Forest (Siskiyou County); Mountain Home Demonstration State Forest (Tulare County); and Kings River Ranger District, Sierra National Forest (Fresno County). The rust was also found infecting western white pine near Cole Creek Lakes, Mokelumne Wilderness, Eldorado National Forest (Amador County). In coastal regions, white pine blister rust continued static in sugar pine, with infections noted near Mt. Sanhedrin (Mendocino and Lake Counties).

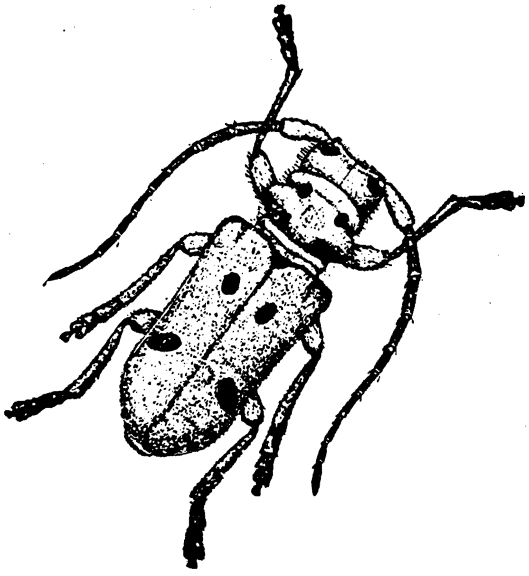
The incidence of blister rust has changed little over the last several years. Dry fall weather in 1988 seems likely to preclude good environmental conditions for successful germination of basidiospores on needles of sugar pine. Normal levels of infection of gooseberries and currants, the alternate hosts, occurred this year.

Fifteen new sugar pine parent trees possessing "major-gene" resistance to white pine blister rust were identified through screening at the Placerville Nursery. Resistant seedlings were sent to the Happy Camp Disease Garden, Klamath National Forest, where they will be evaluated for additional rust-resistance mechanisms.

An abundant sugar pine cone crop was utilized to make over 1700 new parent tree collections for future rust-resistance evaluation. Over 600 seed lots were sown at Chico Tree Improvement Center for evaluation of resistance.

BRUSH DIEBACK. The dieback of chaparral species continued in low elevation sites in many areas of southern California. Concern over the dieback centers primarily on the fire danger created by large areas containing dead brush. The fungus Botryosphaeria ribis (B. dothidea) has been recovered from eight species of dying brush. The role of B. ribis, along with drought stress and air pollution, is being studied at the USDA-Forest Service, Pacific Southwest Forest and Range Experiment Station in Riverside.





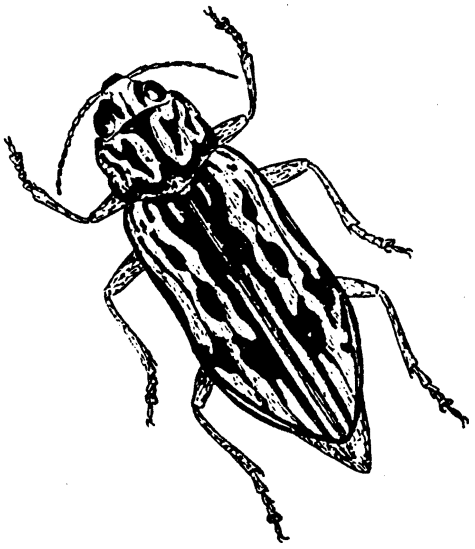


TABLE III. FOREST DISEASES REPORTED - 1988[a]

AGENT	HOST	COUNTY
ABIOTIC INJURIES		
Red belt	JP	Lassen
Winter damage	CN, HW	Humboldt
Frost	WF	Modoc
Drought	TF,JP	Nevada, Sierra
	DF,WF,HW	Humboldt
	JP,PP	Lassen
	PP	Siskiyou
	RF	El Dorado
	IC	Shasta
CANKER DISEASES		
Fusicoccum sp.	PM	Humboldt
Dermea sp.	DF	Humboldt
Phomopsis sp.	DF,RW	Humboldt
Unknown fungus	DF	Mendocino
	DF	Humboldt
	MA	Mendocino
Fusarium subglutinans	MP	Los Angeles, San Benito, San Luis Obispo, San Diego, Santa Barbara, San Francisco
FOLIAGE DISEASES		
Elytroderma deformans	PP	San Bernardino, Kern
	JP	Shasta
Scirrhia pini	MP	Monterey, Mendocino
Maple Scorch	BM	Trinity
NURSERY DISEASES		
Fusarium oxysporum	DF,PP	Humboldt
	DF	Siskiyou
Phomopsis sp.	DF	Humboldt
Phoma sp.	DF	Humboldt
Botrytis sp.	DF	Humboldt
	RW	Humboldt

TABLE III. (Cont.)

AGENT	HOST	COUNTY
NURSERY DISEASES		
Septoria sp.	AL	Humboldt
Sirococcus sp.	DF	Humboldt
Keithia sp.	WRC	Humboldt
Chemical (Dazomet)	DF,RF,WF	Humboldt
Unknown	RF,WF	Humboldt
	PP	Humboldt
Excessive heat	RF	El Dorado
PARASITIC PLANTS		
Arceuthobium californicum	SP	Colusa
Arceuthobium occidentale	BP	Mendocino
ROOT DISEASES		
Armillaria sp.	TO	Humboldt
	DF	Humboldt
Leptographium wageneri	DF	Humboldt, Del Norte, Trinity
Phytophthora lateralis	POC	Del Norte
RUST DISEASES		
Cronartium ribicola	SP	Siskiyou, Fresno, Tulare
	WWP	Amador
Endocronartium harknessii	MP	Humboldt

a. Not a complete listing for all locations reported, nor for reports of common diseases.

HOST ABBREVIATIONS

AL = Alder
BM = Bigleaf maple
BP = Bishop pine
CN = Conifer
DF = Douglas-fir
HW = Hardwoods
IC = Incense-cedar
JP = Jeffrey pine
MA = Madrone
MP = Monterey pine
POC = Port-Orford-cedar
PP = Ponderosa pine
RF = Red fir
RW = Redwood
TF = True firs
TO = Tan oak
SP = Sugar pine
WF = White fir
WRC = Western red cedar
WWP = Western white pine

STATUS AND CONTROL OF WEEDS

California's conifer plantations continue to feel the effects of competing vegetation, especially in light of the two consecutive drought years. Without the use of herbicides, the USDA-Forest Service is continuing their program of manual treatments aimed primarily at conifer survival. Due to limited budgets and the high cost of these manual treatments, release work directed toward growth increase is of secondary importance. Manual treatments include grubbing, chainsaw cutting, discing, terracing and paper collars. The majority of the weed control projects on private lands are being accomplished using herbicides. The following table compares herbicide use on California forest lands for January through June of 1986 and 1987.

Table IV. Herbicide Use on California Forest Lands for the Period January throught June, 1986 and 1987

	Acres Treated, Jan.-June	
Chemical	1986	1987
2,4-D	5,875	6,481.5
Triclopyr	4,390	8,821
Glyphosate	1,229	687
Hexazinone	437	1,772
Atrazine/Dalapon	258	306
Picloram	234	10
Dichlorprop	111	13
Total	12,534	18,090.5

Weeds continue to be a primary pest problem at the Placerville Nursery (El Dorado County).

STATUS AND CONTROL OF ANIMAL PESTS

A Report to the California Forest Pest Council
from the Animal Damage Committee

John Borrecco, Chair
Robert H. Schmidt, Secretary

Condition Reports compiled by Robert H. Schmidt

25 October 1988

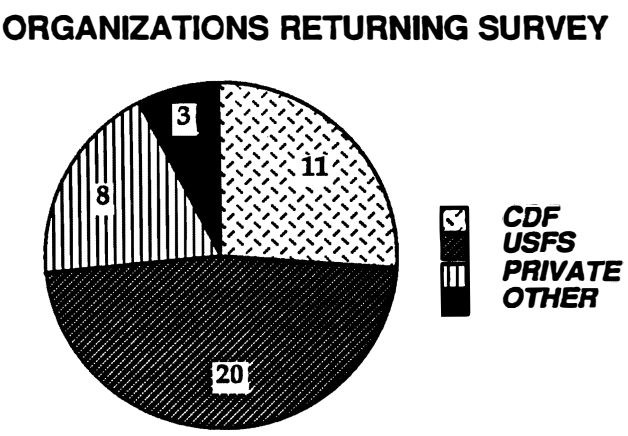
Introduction

This report is the compendium of the "Animal Damage to Forest Trees" survey sent out as part of the California Forest Pest Council Animal Damage Committee's annual overview of forest vertebrate pest conditions in California.

In August, 1988, we sent out 85 "Animal Damage to Forest Trees" surveys to state, federal, and private foresters, companies, and agencies throughout California. Forty-nine (49%) were received and are included in this analysis.

Respondents and Location of Reports

Surveys were returned by representatives of the U.S. Forest Service (n = 20), California Department of Forestry and Fire Protection (n = 11), private timber companies (n = 8), and other organizations (n = 3; BLM, PG&E, and University of California Cooperative Extension). Neither the BLM nor the PG&E respondent reported any damage. Counties represented by the returned reports cover approximately 3/4 of the land area of California (represented below in black).



Scope of Damage

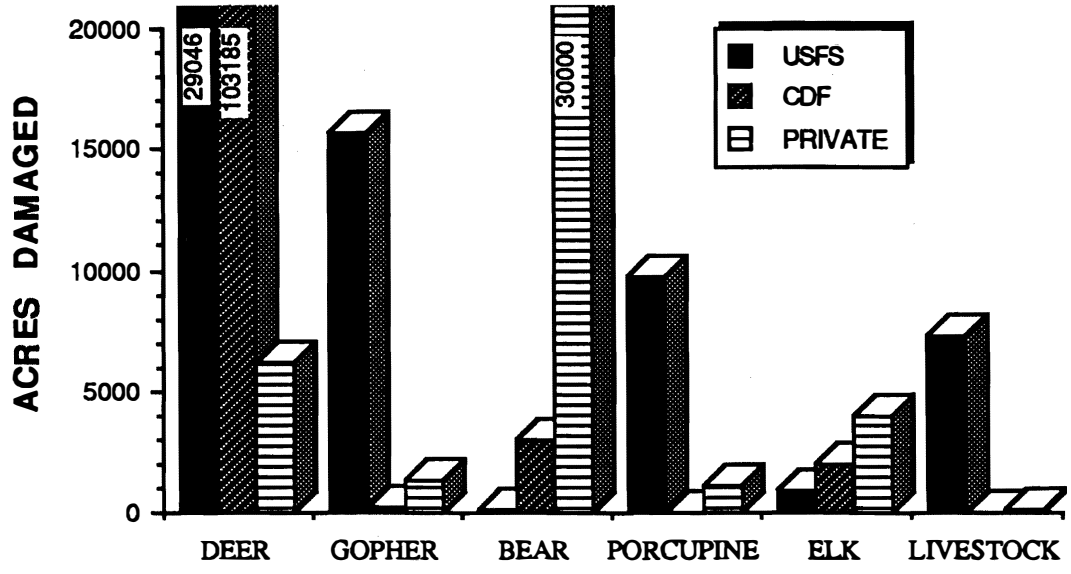
Damage from all sources was reported on 219,166 acres of forest lands.

NUMBER OF ACRES DAMAGED

SPECIES	USFS	CDF	PRIVATE	TOTAL
Beaver	0	5	200	205
Birds	0	0	0	0
Bear	100	3000	30000	33100
Deer	29046	103185	6200	138431
Woodrat	40	100	500	640
Elk	850	2000	4000	6850
Meadow Mice	0	0	0	0
Mountain Beaver	246	0	200	446
Pocket Gopher	15720	200	1287	17207
Porcupine	9687	1	1108	10796
Rabbit	765	0	0	765
"Mice"	0	0	0	0
Tree Squirrels	0	3300	0	3300
Domestic Stock	7296	0	130	7426

ACRES REPORTED DAMAGED - 1988

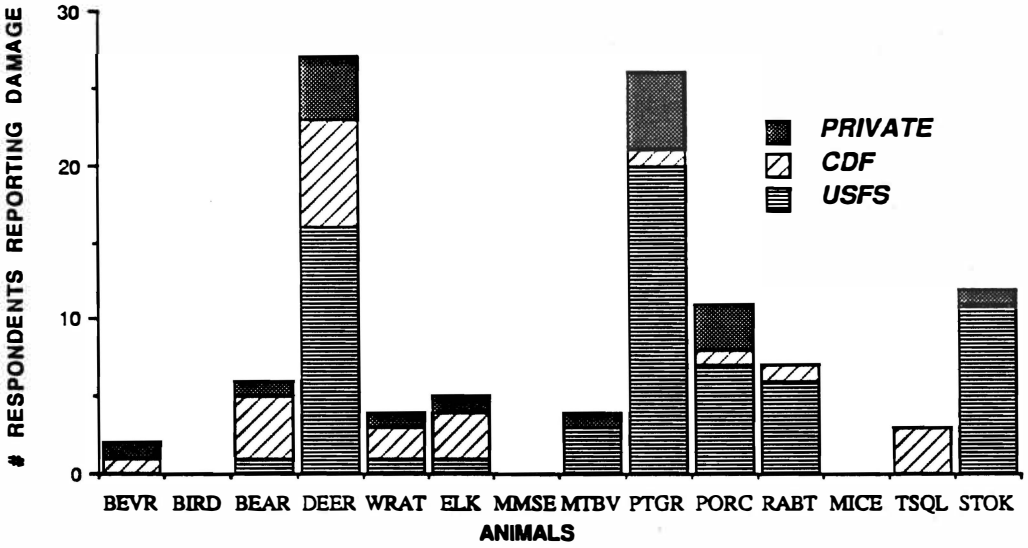
FOR SPECIES WITH TOTAL DAMAGE > 5000 ACRES



Species Causing Damage

A variety of mammal species are causing damage to forest trees, and the damage varies by area and agency. The majority of respondents reported damage from deer and pocket gophers (below). No damage from birds, meadow mice, or other "mice" (which may include shrews) was reported.

SPECIES CAUSING DAMAGE



BEVR - beaver (*Castor canadensis*)
BIRD - birds (Aves)
BEAR - black bear (*Ursus americanus*)
DEER - mule deer (*Odocoileus hemionus*)
WRAT - woodrat (*Neotoma* spp.)
ELK - elk (*Cervus elaphus*)
MMSE - meadow mice (*Microtus* spp.)
MTBV - mountain beaver (*Aplodontia rufa*)
PTGR - pocket gopher (*Thomomys* spp.)
PORC - porcupine (*Erethizon dorsatum*)
RABT - rabbit (*Lepus* or *Sylvilagus* spp.)
MICE - other "mice" (*Peromyscus, Sorex* spp.)
TSQL - tree squirrels (*Sciurus* spp.)
STOK - domestic stock (cattle and sheep)

Number of Respondents Reporting Damage

(excluding "others", n = 39)

SPECIES	USFS	CDf	PRIVATE	TOTAL
Beaver	0	1	1	2
Birds	0	0	0	0
Bear	1	4	1	6
Deer	16	7	4	27
Woodrat	1	2	1	4
Elk	1	3	1	5
Meadow Mice	0	0	0	0
Mountain Beaver	3	0	1	4
Pocket Gopher	20	1	5	26
Porcupine	7	1	3	11
Rabbit	6	1	0	7
"Mice"	0	0	0	0
Tree Squirrels	0	3	0	3
Domestic Stock	11	0	1	12

Discussion

Animal damage to forests is not on the decline in California. Pocket gophers and deer continue to be significant problems, and indications are that pocket gopher damage is on the increase. With additional restrictions on the use of strychnine as a rodenticide a real possibility, continued damage must be anticipated. Deer damage is a continual but predictable problem, and the use of seedling protection devices and repellents continue to make this problem manageable, at least in some areas. Bear damage along the north coast continues to be a problem, and socio-political factors will make this a "high exposure" situation for the future.

The Animal Damage Committee anticipates revising the "Animal Damage to Forest Trees" survey to allow more rigorous analyses and between-year comparisons. We hope to have a revised survey in use for the 1989 conditions report.

Acknowledgments

We thank all the participants throughout California who completed the condition report forms. Pam Tinnin was particularly helpful in upgrading the appearance of this year's report.

For additonal information about the contents of this report, contact R. H. Schmidt, University of California, Hopland Field Station, 4070 University Road, Hopland, California 95449 USA. Printed in Hopland, California.

BEAVER

Species Damaged: Oaks, alders
Damage Trend: Stable to Increasing.
Control Methods: None (100%)
Damage Locations: Shasta and Humboldt Counties
Comments: None

BIRDS

NO DAMAGE REPORTED IN 1988.

BEAR

Species Damaged: Redwood, Douglas Fir, Hemlock, Ponderosa Pine
Damage Trend: Stable to Increasing.
Control Methods: Hunting (57%), Trapping (14%), None (29%)
Damage Location: Del Norte, Humboldt,and Siskiyou Counties
Comments: Damage generally to trees 10-85 years old.

DEER

Species Damaged: White Fir, Pondersa Pine, Douglas Fir, Jeffrey Pine, Red Fir, Coulter Pine, Giant Sequoia, Lodgepole Pine, Incense Cedar
Damage Trend: Generally stable.
Control Methods: Seedling Protection (52%), Repellents (14%), Hunting (7%), None (27%)
Damage Location: Plumas, Yuba, Sierra, Tehama, Lake, Mendocino, Tulare, Kern, El Dorado, Placer, Siskiyou, Shasta, Trinity, Lassen, Butte, Modoc, Humboldt, Calaveras, Tuolumme, Fresno, Madera, Mariposa, Amador, San Bernadino, Riverside, and Del Norte Counties
Comments: Most damage occurs in plantations to seedlings and trees less than 10 years old.

WOODRAT

Species Damaged: Douglas Fir
Damage Trend: Stable.
Control Methods: None (100%)
Damage Location: Humboldt County
Comments: Damage occurs to trees in 1-20 year age class in plantation environment.

ELK

Species Damaged: Ponderosa Pine, Jeffrey Pine, Sugar Pine, Douglas Fir, Incense Cedar, and White Fir
Damage Trend: Stable to Increasing.
Control Methods: Seedling Protection (25%), Hunting (50%), None(25%)
Damage Location: Siskiyou, Del Norte, and Humboldt Counties
Comments: Damage is concentrated in 1-5 year age class.

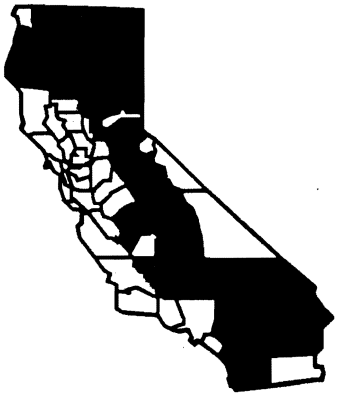
MEADOW MOUSE

NO DAMAGE REPORTED IN 1988.

MOUNTAIN BEAVER

Species Damaged: Douglas Fir, White Fir, Red Fir, Incense Cedar, Ponderosa Pine
Damage Trend: Stable.
Control Methods: None (100%)
Damage Location: Siskiyou, Humboldt, Trinity, Shasta, and Tehama Counties
Comments: Damage occurs to trees in 1-20 year age class.

POCKET GOPHER



Species Damaged: Jeffrey Pine, Ponderosa Pine, Sugar Pine, White Fir, Red Fir, Douglas Fir, Coulter Pine, Incense Cedar, Sequoia, Coulter Pine, Bishop Pine, Monterey Pine, and Lodgepole Pine
Damage Trend: Static to Increasing.
Control Methods: Strychnine (54%), Trapping (4%), Disking (4%), None (38%)
Damage Location: El Dorado, Placer, Kern, Tulare, Siskiyou, Plumas, Butte, Yuba, Sierra, San Diego, Shasta, Modoc, Humboldt, San Bernadino, Riverside, Amador, Fresno, Madera, Mariposa, Lassen, Calaveras, Tuolumne, Tehama, and Trinity Counties
Comments: Most damage concentrated on trees in 1-10 year age class.

PORCUPINE

Species Damaged: Ponderosa Pine, Pinyon Pine, Jerry Pine, Lodgepole Pine, Douglas Fir
Damage Trend: Stable to Increasing.
Control Methods: Trapping (18%), Baiting (9%), None (73%)
Damage Location: Plumas, Tehama, Ventura, Shasta, Modoc, Fresno, Madera, Mariposa, Lassen, Siskiyou, Humboldt, and Trinity Counties
Comments: Damage is generally directed toward older trees (25-60 years), but some damage occurs to trees in the 3-25 year age class.

RABBITS

Species Damaged: Douglas Fir, Jeffrey Pine, Ponderosa Pine, Sugar Pine, White Fir, Red Fir, and Coulter Pine
Damage Trend: Stable.
Control Methods: Seedling Protection (33%), None (67%)
Damage Location: Fresno, Madera, Mariposa, Del Norte, Humboldt, Tulare, San Bernadino, Riverside, Amador, El Dorado, Shasta, Plumas, Lassen, Butte, Tehama, Siskiyou, Modoc, and Trinity Counties
Comments: Damage to 1-5 year old stock in plantations.

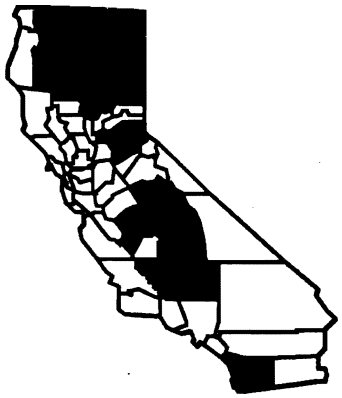
"MICE"

NO DAMAGE REPORTED IN 1988.

TREE SQUIRRELS

Species Damaged: Sugar Pine, Ponderosa Pine, Douglas Fir
Damage Trend: Stable to Decreasing.
Control Methods: Hunting (50%), None (50%)
Damage Location: Lake, Shasta, Siskiyou, and Napa Counties
Comments: Damage to trees older than 40 years.

DOMESTIC STOCK



Species Damaged: Ponderosa Pine, Lodgepole Pine, Douglas Fir, White Fir, Red Fir, Jeffrey Pine, Sugar Pine, Coulter Pine, Black Oak
Damage Trend: Generally Stable.
Control Methods: Fencing (18%), Seedling Protection (8%), Salt Block (8%), Timing (8%), Vegetation Management (8%), None (50%)
Damage Location: Siskiyou, Shasta, Tehama, Trinity, Fresno, Madera, Mariposa, Tulare, Amador, El Dorado, Plumas, Lassen, Butte, Modoc, Kern, Placer, Lassen, and San Diego Counties
Comments: Damage, through feeding and trampling, to 1-10 year age class.

SUMMARY OF ANIMAL DAMAGE TO FOREST TREES

Company or Administrative Unit _____

County(ies) _____

ANIMAL	TREE SPECIES	AGE CLASS	DAMAGE ACRES	DAMAGE TREES/ ACRE	PLANTATION OR OTHER	DAMAGE TREND	CONTROL USED
1. BEAVER							
2. BIRDS							
3. BLACK BEAR							
4. DEER							
5. DUSKY-FOOTED WOODRAT							
6. ELK							
7. MEADOW MOUSE							
8. MOUNTAIN BEAVER							
9. POCKET GOPHER							
10. PORCUPINE							
11. RABBITS							
12. SMALL SEED-EATING MAMMALS							
13. TREE SQUIRRELS							
14. DOMESTIC STOCK							
15.							
16.							
17.							
18.							

REMARKS:

19. REPORTED BY: NAME:

TITLE: DATE:

DIRECTIONS: Please provide as much information as possible for each animal species causing damage. Do not be concerned if you cannot complete all of the columns for a species. If more than one line is needed for a species, use lines 15 through 18. Under Damage Trend, indicate whether damage is static, increasing, or decreasing. Under Control Used, state method employed and number of acres treated. Rank the relative seriousness of your five major problems by numbering the species name in the Animal column.

1988 Animal Damage Committee, California Forest Pest Council, RHS:pt

BLACK BEAR DAMAGE.

As stated by Lloyd Ingels, who needs to give a description of a black bear? This is surely one species of wildlife that is recognizable to even the most novice observer. However, the damage caused by black bears to conifers may not be so readily distinguishable.

Damage has been reported to conifers over the last 50 years. Reports of feeding damage have been recorded on Alaskan yellow cedar, balsam fir, Douglas-fir, Bishop pine, white spruce, western birch and coastal redwood. The species of concern in California are Douglas-fir and coastal redwood.

Damage to coast redwood was first reported in 1929 by Emmanuel Fritz. It was not until Fred Glover, Humboldt State University, began his work in the early 1950's that black bear depredation on conifers received any serious attention in California. He described similar damage to both Douglas-fir and coast redwoods in Humboldt County.

From the time of Glover's work until the 1980's, black bear depredation went virtually unreported along Califonria's north coast. Though foresters and loggers were aware of minimal damage, the general feeling was that bear feeding damage was sporadic and isolated.

In the early to mid-1980's, people working in the woods reported an increase of visible bear depredation throughout stands of second growth redwoods. The damage increased to a level that the Animal Damage Control Unit of the USDA (formerly U.S. Fish & Wildlife Service) was asked to get involved with a depredation program. In 1988 the California Department of Fish & Game opted to hold a special season bear hunt on private forest land in lieu of continuing the depredation program. The season allowed the taking of 250 bears. As of this writing, a total of 21 bears have been taken.

Black bear feeding damage has similar visual characteristics, whether on coast redwood or Douglas-fir. The bark is loosened at the base of the tree and then peeled upward in long strips. Once the cambium is exposed, the bears use their incisors to scrape off the tissue.

The wounds are very different than those left by feeding woodrats, gray squirrels or porcupines. Furthermore, the degree of damage can range from a single bite of bark removed to the entire base of the tree being girdled and all of the bark removed 60 to 70 feet above the ground. On these severely damaged trees the limiting factor that keeps the bears from removing all of the bark is the tree's physical inability to support the weight of the bear.

Typically, feeding damage occurs in the months of May, June and early July. This is a period of the year following the salmonid spawning season and prior

particularly redwoods, are those most often fed upon by black bears, though both smaller and larger trees have been observed. Often damage occurs in concentrated areas, but it can spread over several acres. A common misconception is that damage occurs predominantly along skid trails and roads. During periods of heavy conifer feeding, as witnessed during the past five years, damage can occur throughout a drainage, regardless of the presence or absence of roads.

Researchers from Humboldt State University, California Fish and Game, University of California Cooperative Extension and Oregon State University are currently investigating different aspects of black bear feeding on conifers throughout northern Califonria and Oregon. Hopefully, through continued efforts, recommendations for minimizing damage will become available.

Figure 4. Black bear damage to a Douglas-fir in the north coast forest of California.

DUTCH ELM DISEASE. Incidence of the disease increased somewhat this year, especially in three counties (Table V). For Santa Clara County this was due to previous delays in removal of confirmed elms by at least one cooperating city and to increased survey by Dutch Elm Disease (DED) Project personnel. In San Mateo County an uncooperative homeowner caused removal delay. Napa County experienced a localized disease flareup.

New locations for DED include Fairfax, Marin County; a new area of El Sobrante, Contra Costa County; and along the Berkeley/Kensington border in Alameda County. Although the disease remains confined to the Bay Area, prospects for continued control and containment are dimmed by proposed substantial budget reductions over the next two years. Samples arriving at the CDF Dutch Elm Disease Laboratory in Santa Rosa suggest that DED has a good foothold in Reno, Nevada.

Table V. NUMBER OF CONFIRMED DED ELM TREES

COUNTY	1984	1985	1986	1987	1988
Alameda	1	0	1	7	3
Contra Costa	29	21	30	35	35
Marin	71	154	125	83	91
Napa	3	2	3	2	9
San Francisco	0	0	0	0	0
San Mateo	54	63	44	47	70
Santa Clara	17	34	41	20	36
Solano	0	0	1	0	0
Sonoma	13	28	14	16	12
TOTAL	188	302	269	210	256

STATUS OF FIRE RECOVERY AREAS, NORTHWESTERN CALIFORNIA. The fire siege of 1987 burned almost 350,000 areas in northwestern California. Burn intensities varied widely. Intense heat and flames consumed or killed almost all vegetation in some areas. Light ground fires caused relatively little damage in other areas. The burns involved virtually all timber types and tree species.

Stress on the survivors was intensified by below-normal preciptiation during both 1987 and 1988. Fire-injured trees began dying within a few months after the burns, and mortality continued into 1988. The only mortality agent evident in some dead trees was fire injury. Beetle attack did not appear to be particularly heavy in most areas. Because of the mosaic of burn intensities and tree species, all of the major species of bark beetles, engraver beetles and flatheaded borers were involved.

Although there is considerable mortality in some burned areas, it appears commensurate with that in nearby unburned areas. Depending on stand conditions and the amount of precipitation received during the past two years, mortality in the unburned areas varies from slightly elevated to several times normal. Mortality levels will remain higher than normal in 1989 and possibly for several additional years. It will take time for trees to fully recover from two years of below-normal precipitation. Also, some of the beetles involved have life cycles extending from a full year to several years.

Efforts are being made to salvage as much material as possible from the burned areas, as well as the scattered drought-caused mortality. Not all of the material can be recovered because of legal restrictions, wildlife concerns, unstable soil and economics. The primary reasons for doing salvage are to recover the value of the wood, lower the fuel loads and to return the accessible commercial land to full productivity.

DOUGLAS-FIR BRANCH FLAGGING/TOP KILLING. Numerous reports of branch flagging and top-killing of Douglas-fir were received from the North Coast area. Seedling, sapling, and pole-sized classes were mainly affected. Trees in natural stands and plantations were affected. The condition was most noticeable on drier, harsher sites or where brush competition was high.

The primary cause of this condition was below normal precipitation in 1987 and 1988. The lack of moisture caused the trees to become more susceptible to several organisms that are generally weakly aggressive. A Douglas-fir twig weevil was believed to be killing some of the smaller twigs and branches. The Douglas-fir engraver beetle, Scolytus unispinosus, was attacking and killing the tops of many of the larger trees. A fungus, Phomopsis sp., was involved in much of the branch flagging, especially of the larger branches. Other fungi were also isolated but identification was not possible. A number of fungi do appear to be involved in this problem, which is expected to continue until a normal moisture regime returns.

SUDDEN DEATH OF EUCALYPTUS. Over the past three years several Eucalyptus globulus in San Mateo and Solano Counties rapidly declined and died. The collapse occurs in late summer and a vascular discoloration of current growth is associated with it. A fungus tentatively identified as a Phoma is readily isolated from the branches, but complete identification and pathogenicity work has not been completed.

DEMONSTRATION THINNING PLOTS IN THE EASTSIDE PINE TYPE, LASSEN NATIONAL FOREST. In 1978-1979 the Forest Service established plots in the eastside pine type to show the effects of thinning on pest-caused tree losses in areas of high tree mortality. The stands chosen were mostly pole-size ponderosa pine mixed with some white fir and incense-cedar, occurred on medium to low sites, and ranged in age from 70 to 90 years. Within the demonstration plots, four levels of stocking density -- 40, 55, 70, and 100 percent of normal basal area -- were established to demonstrate the biological and economic alternatives available for management planning. (Normal basal area is the basal area that a stand should have when fully stocked with trees, which, in the demonstration areas, ranges from 185 to 215 sq ft/ac depending on site quality.) Seven years after thinning, the treatments had reduced mortality from 86 to 100 percent of the level in unthinned stands (Table VI).

TABLE VI. COMMERCIAL TREE MORTALITY BY STOCKING LEVEL, SEVEN YEARS AFTER THINNING[a]

Year	Residual Stocking After Thinning[b] 40%	55%	70%	100%
		Trees per Acre		
1980	0.0	0.2	0.2	2.4
1981	0.0	0.0	0.7	2.4
1982	0.0	0.5	0.3	3.6
1983	0.0	0.1	0.8	4.1
1984	0.0	0.0	0.0	1.0
1985	0.0	0.2	0.0	0.6
1986	0.0	0.0	0.0	1.3
1987	0.0	0.0	0.0	1.4
1988	0.0	0.0	0.0	0.0
Mean	0.0	0.1	0.2	1.9
Range	0	0-0.5	0-0.8	0.0-4.1
Percent Mortality Reduction Compared with Normal Basal Area	100	94.7	89.5	---

a. Commercial trees are 8 inches dbh and larger, have straight boles, and yield a 10-foot log with a 6-inch top. Trees were killed by the mountain pine beetle.
b. Percent of normal basal area.

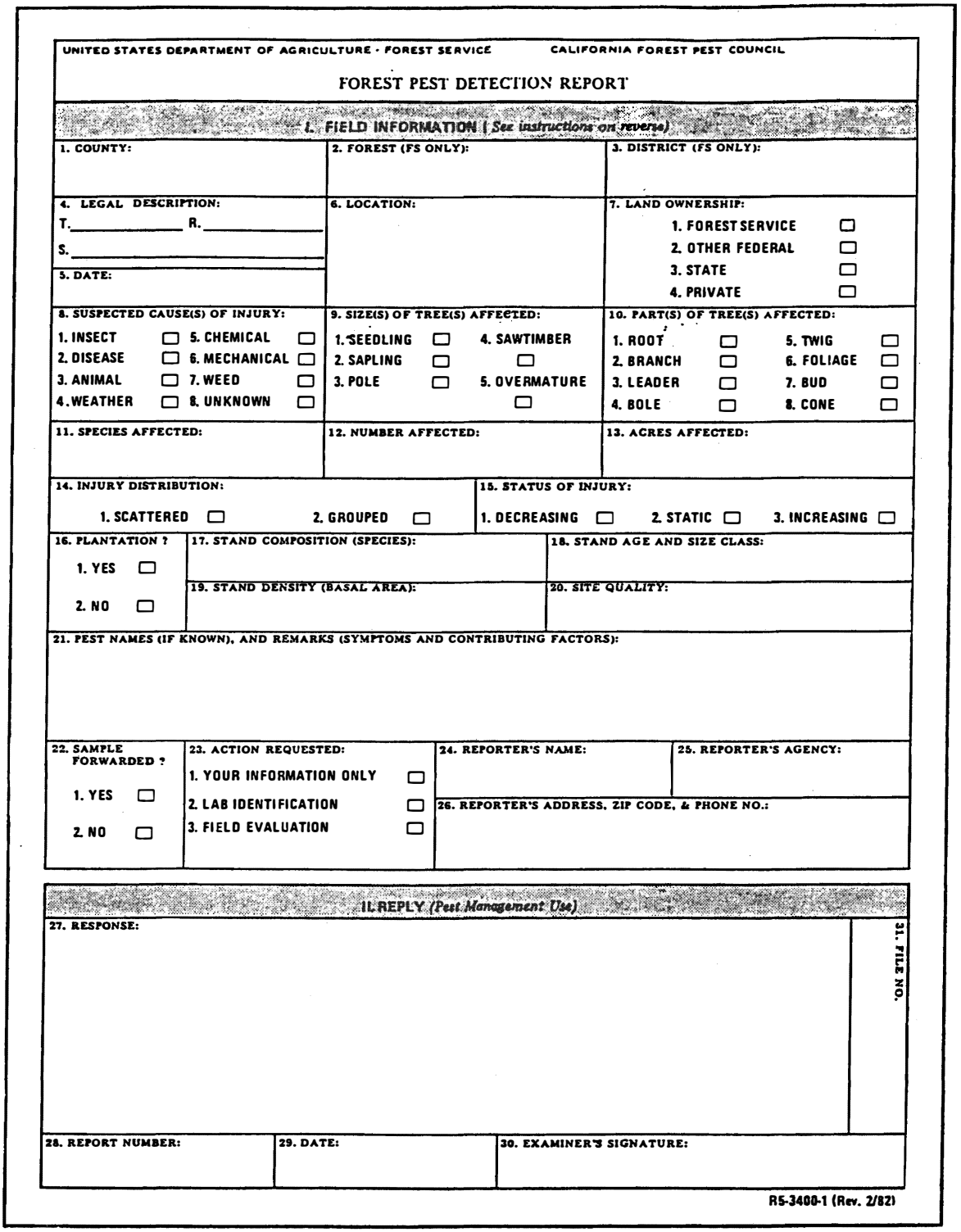
DOUGLAS-FIR TUSSOCK MOTH-BACILLUS THURINGIENSIS PILOT PROJECT/FIELD EXPERIMENT. In mid-summer, 1987, approximately 5,700 acres of Douglas-fir tussock moth (DFTM) defoliation on white fir was detected in northern California on the La Porte and Quincy Districts (Plumas National Forest), the Almanor District (Lassen National Forest) and private lands in Plumas County. An environmental analysis was conducted and a decision made to implement a combined pilot project/field experiment using Bacillus thuringiensis (Bt). The objective of the project was to evaluate the efficacy of Bt formulated as Thuricide 32LV aqueous concentrate at a dosage rate of 40 BIU's/ha (16 BIU's/ac). The Bt was applied at two different volumes: 1) undiluted at 4.7 liters/ha (64 oz/ac) and 2) diluted 1:1 with water at 9.4 liters/ha (128 oz/ac).

Four blocks were established for each of three treatments: (1) Bt undiluted; (2) Bt diluted 1:1; and (3) untreated check. Each block consisted of three variable-sized plots, one randomly assigned for each treatment, for a total of 12 plots (Table VII). Efficacy was measured in terms of a) population levels (larvae/cocoons/egg masses) and b) resource damage (defoliation/mortality). Spraying was conducted June 26 through June 29 using an Ag Tractor aircraft equipped with six Micronair rotary atomizers on a standard boom. The daily order of plot treatment was randomized and two helicopters were used to mark the flight paths for the spray plane. The spraying was completed without incident.

Mean prespray larval densities ranged from 85.9 to 856.2 larvae per 1000 sq in of foliage. Postspray populations ranged from 7.6 to 216.2 larvae per 1000 sq in. The treated plots were significantly different than the untreated checks in three of the four blocks. The corrected percent reduction (Abbotts Formula) in the three blocks ranged from 22% to 95.4%. The two treatments were not significantly different although the 1:1 dilution tended to be somewhat more efficacious than the undiluted application. Efficacy evaluated in terms of resource damage is not yet available.

Table VII. A DOUGLAS-FIR TUSSOCK MOTH FIELD EXPERIMENT USING BACILLUS THURINGIENSIS, PLUMAS COUNTY, CALIFORNIA, 1988

Block	Plot	Treatment		Area Treated		Spray Date
		(l/ha)	(oz/ac)	(Hectares)	(Acres)	
	1	9.4	128	202	500	6/29/88
A	2	4.7	64	219	540	6/29/88
	3	0	0	-	-	---
	4	4.7	64	239	590	6/26/88
B	5	0	0	-	-	---
	6	9.4	128	162	400	6/27/88
	7	4.7	64	134	330	6/27/88
C	8	0	0	-	-	---
	9	9.4	128	150	370	6/27 88
	13	4.7	64	295	730	6/28/88
E	14	0	0	-	-	---
	15	9.4	128	142	350	6/28/88



UNITED STATES DEPARTMENT OF AGRICULTURE - FOREST SERVICE CALIFORNIA FOREST PEST COUNCIL

FOREST PEST DETECTION REPORT

I. FIELD INFORMATION (See instructions on reverse)

1. COUNTY:
2. FOREST (FS ONLY):
3. DISTRICT (FS ONLY):
4. LEGAL DESCRIPTION: T._____ R._____ S._____
5. DATE:
6. LOCATION:
7. LAND OWNERSHIP: 1. FOREST SERVICE ☐ 2. OTHER FEDERAL ☐ 3. STATE ☐ 4. PRIVATE ☐
8. SUSPECTED CAUSE(S) OF INJURY: 1. INSECT ☐ 2. DISEASE ☐ 3. ANIMAL ☐ 4. WEATHER ☐ 5. CHEMICAL ☐ 6. MECHANICAL ☐ 7. WEED ☐ 8. UNKNOWN ☐
9. SIZE(S) OF TREE(S) AFFECTED: 1. SEEDLING ☐ 2. SAPLING ☐ 3. POLE ☐ 4. SAWTIMBER ☐ 5. OVERMATURE ☐
10. PART(S) OF TREE(S) AFFECTED: 1. ROOT ☐ 2. BRANCH ☐ 3. LEADER ☐ 4. BOLE ☐ 5. TWIG ☐ 6. FOLIAGE ☐ 7. BUD ☐ 8. CONE ☐
11. SPECIES AFFECTED:
12. NUMBER AFFECTED:
13. ACRES AFFECTED:
14. INJURY DISTRIBUTION: 1. SCATTERED ☐ 2. GROUPED ☐
15. STATUS OF INJURY: 1. DECREASING ☐ 2. STATIC ☐ 3. INCREASING ☐
16. PLANTATION ? 1. YES ☐ 2. NO ☐
17. STAND COMPOSITION (SPECIES):
18. STAND AGE AND SIZE CLASS:
19. STAND DENSITY (BASAL AREA):
20. SITE QUALITY:
21. PEST NAMES (IF KNOWN), AND REMARKS (SYMPTOMS AND CONTRIBUTING FACTORS):
22. SAMPLE FORWARDED ? 1. YES ☐ 2. NO ☐
23. ACTION REQUESTED: 1. YOUR INFORMATION ONLY ☐ 2. LAB IDENTIFICATION ☐ 3. FIELD EVALUATION ☐
24. REPORTER'S NAME:
25. REPORTER'S AGENCY:
26. REPORTER'S ADDRESS, ZIP CODE, & PHONE NO.:

II. REPLY (Pest Management Use)

27. RESPONSE:
31. FILE NO.
28. REPORT NUMBER:
29. DATE:
30. EXAMINER'S SIGNATURE:

R5-3400-1 (Rev. 2/82)

FOREST PEST DETECTION REPORT FORM. The Conditions Report was compiled from information provided by Federal, State, and private forest land managers and individuals. Copies of this form are available at local offices of the Forest Service or the California Department of Forestry and Fire Protection.

THE COOPERATIVE FOREST PEST DETECTION SURVEY is sponsored by the California Forest Pest Council. The Pest Council encourages Federal, State, and private land managers and individuals to contribute to the Survey by submitting pest injury reports and samples in the following manner.

Federal Personnel. Send all detection reports through channels, and mail injury samples with a copy of this report to: **USDA, Forest Service, Forest Pest Management, 630 Sansome St., San Francisco, CA. 94111**

State Personnel. Send all detection reports through channels, and mail injury samples with a copy of this report to: **California Dept. of Forestry & Fire Protection, 1416 - 9th Street, Sacramento, CA. 95814**

Private Land Managers and Individuals. Send all detection reports and samples to: **California Dept. of Forestry & Fire Protection, 1416 - 9th Street, Sacramento, CA. 95814**

COMPLETING THE DETECTION REPORT FORM

Heading (Blocks 1-7). Enter all information requested. In Block 6, Location, note distinguishing landmarks and place names so that the injury center can be relocated. If possible, attach a location map to this form.

Injury Description (Blocks 8-15). Check as many boxes as are applicable, and fill in the requested information as completely as possible.

Stand Description (Blocks 16-20). This information will aid the examiner in determining how the stand conditions contributed to the pest problem. In Block 17, indicate the major tree species in the overstory and understory. In Block 18, indicate the stand age in years, and/or the size class (seedling-sampling; pole; young sawtimber; mature sawtimber; overmature, or decadent).

Pest Names (Block 21). White a detailed description of the pest or pest, the injury symptoms, and any contributing factors.

Action Requested (Block 23). Mark "Field Evaluation" only if you consider the injury serious enough to warrant a professional evaluation. Mark "Your Information Only" if you are reporting a condition that does not require further attention. All reports will be acknowledged and questions answered on the lower part of this form.

Reply (Section II). Make no entries in this block; for examining personnel only. A copy of this report will be returned to you with the information requested.

Handling Samples. Please submit injury samples with each detection report. If possible, send several specimens illustrating the stages of injury and decline. Keep samples cool and ship them immediately after collection. Send them in a screw-top mailing tube or other sturdy container, and enclose a completed copy of the detection report.

YOUR PARTICIPATION IN THE COOPERATIVE FOREST PEST DETECTION SURVEY IS GREATLY NEEDED AND APPRECIATED. Additional copies of this form are available from the Forest Service, Forest Pest Management, and from the California Department of Forestry and Fire Protection.

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